

Magnetic properties of magnetoactive spin clusters

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Abstract

A simple model is proposed for describing magnetic properties of magnetoactive nanoclusters, which permits exact analytic solution. Exact expressions are obtained for thermodynamic characteristics of the model, which hold in the entire range of temperatures, magnetic fields, and interaction parameters. It is found that in the case of easy-axis anisotropy, the field dependence of magnetization of a nanocluster consisting of N particles with a spin of $1/2$ has $[N/2]$ fractional plateaus ($[\dots]$ is the integer part) corresponding to polarized phases with ruptures singlet pairs. A nonmonotonic behavior observed for the magnetic susceptibility of an easy-plane cluster is typical of gap magnets. The spin gap between the ground state and excited states is proportional to the anisotropy parameter. © 2010 Pleiades Publishing, Ltd.

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